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LEAD TOLERANCE IN DATE PALM (*PHOENIX DACTYLIFERA* L.) PLANTLETS DERIVED FROM TISSUE CULTURE, ANATOMICAL STUDY

Khairullah M. Awad*, Ansam M. Salih Yahya, N. Khalaf Aqeel and A. Suhim Mohammed H. Abass

Date palm Research Centre, Basrah University, Iraq.

Abstract

Soil pollution by heavy metal including lead (Pb) is a widespread problem; and the toxicity of lead as a major heavy metals pollutant to plants has gained a considerable attention around the world. Our study revealed the negative impacts of Pb at various concentrations (2.5, 5 and 10 mg.L^{-1}) on the in vitro growth of date palm plantlets; and mostly on the basis of anatomical analysis. Results showed that the Pb treatment significantly reduced the height and fresh weight of date palm plantlets compared to untreated ones; fresh weight and height of plantlets were 252.33 mg and 4.46 cm in control plantlets reduced to 147.33 mg and 3.50 cm when plantlets grown in medium contain 2.5 mg.L^{-1}. Interestingly, both fresh weight and height were increased to 272.33 mg and 4.03 when plantlets passed from 2.5 to 10 mg.L^{-1} Pb. Results of anatomical analysis showed no significant difference among all treatments on abaxial and adaxial epidermis, while the upper and lower cuticle layer increased when plantlets were exposed to Pb, these traits decreased when plantlets passed from low to high concentration of Pb. Mesophyll thickness was decreased from 218.90 µm in plantlets grown in medium without Pb to 162 µm in plantlets grown in medium supplemented with Pb at 2.5 mg.L^{-1}, the mesophyll thickness increased in the plantlets passed from 2.5 to 5 mg.L^{-1} and reached to 465.16 µm. The same pattern of results was observed in the blade thickness; as well as; the number of vascular bundles and the width and height of vascular bundles. Our results demonstrate the usefulness of in vitro technique in testing and generating a tolerant clone of date palm to lead stress.

Key words : Anatomical, date palm, heavy metals, mesophyll, tolerance, vascular bundles.

Introduction

All the dynamic development of anthropogenic activities during the 20th century resulted in high level of the environment pollution (Gavrilescu *et al*., 2015), the heavy metals among dangerous pollutants are considered hazardous chemicals because of their high toxicity which resulted from their bioaccumulation and non-biodegradable characteristics (Verma and Dwivedi, 2013). Lead (Pb) is one of the most toxic metals that pollute the environment and threating living organism's health (Taghizadeh *et al*., 2015). Plant biotechnology has been used to improve plant genotypes resistance to several stresses such as heavy metals (Kaeppler *et al*., 2000), in this context, tissue culture technique rise as auseful procedure in screeningof metal tolerance in plant (Toan, 2004; Gatti, 2008). This technique has been used to screen tolerant genotypes of Pb for numerous plants for example, *Ailanthus altissima* (Gatti, 2008), *Cynodon dactylon* L. (Taghizadeh *et al*., 2015) and *Daphne* species (Wiszniewska *et al*., 2015). Date palm *Phoenix dactylifera* L. belonging *Arecaceae* family, propagating by three main methods, sexually through seeds, vegetatively by offshoots and the third method is tissue culture multiplication (Abass, 2013). Tissue culture technique is effective method to date palm propagation, and it is a rapid system for large number production of genetically uniform plantlets (Aslam and Khan, 2009). Thus, this technique can be used in the production of plants which have resistant characteristics to biotic and abiotic stresses (Abass, 2016). Al-Mansoori *et al*. (2007) and Aldhebiani *et al*. (2018),applied this technique to screen *P. dactylifera* L. genotypes for salt tolerance. To the best of our knowledge thereis no previous reports onscreening Pb-tolerance in *P. dactylifera* L. genotypes by using tissue culture

***Author for correspondence :** E-mail: kmaaljabary@yahoo.com